

REACTIONS OF SUPROXIDE ANION RADICALS

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Some recent pulse-radiolysis studies on the reactions of the superoxide anion radical with iron complexes, modified and native cytochrome c and quinones are presented. These reactions will be discussed in terms of the generations of O_2^- , its quantitative measurement, and its conversion into more reactive species.

Thermodynamic Aspects of Reactions Involving Oxygen Radicals

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Oxygen radicals are involved in many deleterious reactions. While rate constants for the reaction of O_2^- and $\cdot OH$ with many small molecules and biomolecules have been determined, the energetics of these reactions have received little attention. The following topics will be discussed:

1. Thermodynamic parameters of O_2^- and $\cdot OH$.
2. Interconversion reactions involving O_2^- , $\cdot OH$, O_3^- and 1O_2 .
3. Reactions of oxyradicals with various biomolecules.

Superoxide Dismutases: Exceptions to the Rules

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Oxygen tolerant organisms usually contain superoxide dismutase (SOD). Lactobacillus plantarum was an apparent exception. We have found that this organism accumulates Mn(II) to ~25 mM and that this Mn(II) serves as a functional replacement for SOD. When starved for Mn(II) or prevented from accumulating Mn(II) by a phosphate deficiency, L. plantarum becomes oxygen intolerant and very sensitive to the lethality of intracellular O_2^- . A second rule has to do with the distribution of the CuZnSOD, which is not usually found in prokaryotes. The exception in this case is the symbiotic Photobacterium leiognathi and we have indications of a very close relationship between the CuZnSOD of P. leiognathi and that of its host fish. This suggests a gene transfer from the fish to the bacterium, as the origin of this prokaryotic CuZnSOD.